

## Computer Graphics 50:198:456/56:198:556 (Spring 2009)

<b>Homework:</b> 4	<b>Professor:</b> Suneeta Ramaswami
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### Programming Assignment #4

This assignment will build on Assignment #3 and contains two parts. In the first part, you will implement lighting effects and additional fly-bys for the planetary system. In the second part, you will incorporate texture maps onto the planets and the sun.

#### Problem Description:

- (A) Incorporate lighting and additional planetary fly-bys. You should have a light source at the Sun, which illuminates the scene. Lighting will involve selecting appropriate lighting and material parameters, which is as much art as science. You will probably need to experiment a bit to get the right effect. Refer to the OpenGL *Programming Guide* for relevant tips.

Use the right mouse button to activate a fly-by which orbits some of the planets. At a minimum, you should include a fly-by for Earth orbiting in the equatorial plane around the equator. For the other planets, experiment with other planes of rotation for the fly-bys. For example, it is more interesting to view Saturn when the fly-by orbits in a plane other than the one containing the rings. The name of the planet should appear as a menu option when the right mouse button is clicked. With these fly-bys, the viewer should be able to see the transition from “night” to “day” and vice-versa while circling the planet. Once again, the fly-by should be done at a reasonable distance from the planet (not too far, not too close).

- (B) Map textures onto each of the planets. Image files can be found in the shared class directory at `/class/runeeta/cgs09/sstexmaps/` on clam. Each of the textures is a  $512 \times 256 \times 3$  array of GLubyte. The images will need to be flipped horizontally by your program. I will discuss this further in class. While there are some pretty nice texture maps of the various moons in the solar system, most of them will be too small to see in detail in this program, and won't justify the computational overhead of mapping textures on them. You should use the moon texture for our moon but can leave the others as just white spheres.

You are not obligated to use these images and may use others if you wish. However, keep in mind that OpenGL does not allow you to load textures directly from image files in standard formats such as .jpeg, .gif etc. You will need to write code to get the image files into a form that can be used by OpenGL to create textures.

You might find it useful to first get the fly-bys working correctly before incorporating lighting effects. Do not use more than one light source in the scene, since that is likely to slow down the interactive part of your program. Read the *Display-list Design Philosophy* of the *Programming Guide* for some tips on performance optimization.

As always, feel free to add more features if you don't find this challenging enough. For example, a more sophisticated fly-through might use the three parameters used to control a flight simulator: the **roll**, **pitch** and **yaw** of the flight vehicle. The typical way

to control this is through the mouse buttons. **Graduate students:** You are required to include at least one of these parameters in the flight simulator for the fly-by. Please indicate clearly how to interact with the flight simulator and how to control each of the parameters.

### **Grading:**

The assignment is worth 150 points. As before, your program will also be judged for “overall impression” (worth 30 points). The rest of the grade is split evenly between parts (A) and (B).

### **What to turn in:**

Email me the **final version** of your program before midnight on May 6, 2009.